

In each case, combining morphological and biochemical inquiry resulted in differentiation of component parts and proposals as to the specific operations performed by those parts. Another development over that period, though, was the discovery that yet other cell organelles performed different functions that contributed to the overall life of the cell. Particularly important in this respect was research on the Golgi apparatus and the lysosome.

The Golgi Apparatus

As I discussed in Chapter 4, in 1949 Claude and Palade challenged the existence of the Golgi apparatus, contending that it was an artifact of staining with osmium or other heavy metals. Claude and Palade's challenge to the reality of the Golgi apparatus was one of the last. A prominent exception was a charge by John Baker (1957; 1963) that many different substances were being conflated under the one label. As I argued in Chapter 3, the Golgi apparatus was a natural target for charges of artifact since, up through Claude and Palade's challenge, observations of it were generally limited to cells fixed with osmium compounds and the evidence for its functional role was far from overwhelming. But this situation changed so definitely that, when Palade together with Marilyn Farquhar (Farquhar & Palade, 1981) wrote a review of research on the Golgi apparatus they commented that "now no one questions that the Golgi apparatus is a distinct cell organelle, or is unaware of its participation in a wide variety of cellular activities. Indeed, the Golgi apparatus, or Golgi complex as it is often called, not only occupies the cell center, but it also has moved toward center stage, because it has been shown to be involved in so many cell activities" (p. 77s). Interestingly, given his earlier opposition, Palade contributed much to the vindication of the Golgi apparatus by providing crucial information about its function.³⁶

³⁶ Despite the vehemence of the challenge he and Claude had issued, in the review of the history of the Golgi apparatus with Farquhar, Palade does not mention his own role as one of the last to challenge the reality of the Golgi apparatus. Farquhar and Palade (1981) write, "The period before the mid 1950s was characterized by controversy concerning the reality of the Golgi apparatus, with the scientific community divided into nonbelievers and believers. The acceptance of the status of the Golgi as a bona fide cell structure depended on whether one believed that the metallic impregnation methods (involving use of silver or OsO₄), which Golgi and others used to demonstrate the apparatus, were staining a common structure with variable form and distribution in different cell types, or alternatively, that these methods resulted in artifactual deposition of heavy metals on different cell structures in different cell types" (p. 77s). Again in 1998, on the occasion of the 100th anniversary of Golgi's discovery, Farquhar and Palade make no reference to Palade's role as challenger of the Golgi: "The debate raged because the Golgi was not visible in living cells and its visualization depended on Golgi's capricious heavy-metal staining method, called the black reaction (*la reazione nera*), which was difficult to reproduce reliably and stained many other structures, including whole neurons" (p. 2).